



X-Plain™ *Treatment for Trigeminal Neuralgia* **Reference Summary**

Trigeminal neuralgia is a condition that affects about 40,000 patients in the US every year. Its treatment mostly involves the usage of oral medications. If medications are not successful in controlling the pain, surgery may be indicated.

This reference summary will help you understand better this disease, the benefits and the risks of the various surgical treatments.

Anatomy

The trigeminal nerve is the nerve responsible for most of the sensation in the face.

There is a nerve on the right side and another one on the left side.

The main part of the nerve or 'ganglion' is located at the base of the brain, deep inside the brain.

From there, it divides into three branches. The first division, known as V1, provides sensation to the eye, upper eyelid, and forehead.

The second division, known as V2, provides sensation to the cheek, lower eyelid, nostril and upper lip and gum.



The third division known, as V3 provides sensation to the area of the jaw, the lower lip and gum. V3 also controls some of the muscles responsible for chewing.

Symptoms and Their Causes

Trigeminal neuralgia is characterized by severe pain in the face. The pain lasts for few seconds and can spread to the rest of the face. However, it is usually limited to one division of the trigeminal nerve.

Between bouts of severe pain, the patient is usually pain free. Specific sites in the patient's face, such as the corner of the mouth, gum, or lip can act as a trigger point. The pain can be set off when one of these sites is touched.

The pain can be so severe that the patient may refrain from eating or speaking for fear of eliciting the pain.

It is still not clear what causes this pain. Trigeminal neuralgia is most often thought to be caused by abnormal compression of the ganglion of the trigeminal nerve by a normal blood vessel that has become more rigid because of advanced age.

Other reasons for trigeminal neuralgia include tumors, multiple sclerosis, and abnormal blood vessels. However, these are very rare.

Medical Treatment

Medications taken by mouth usually take care of the symptoms of trigeminal neuralgia.

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These include medications usually taken for seizures such as carbamazepine (Tegretol™), or phenytoin (Dilantin™).

Other medications such as Baclofen (Lioresal™), usually used to help patients relax their muscles, could be tried.



If these medications used alone, or in combination, fail to reduce pain, or are not tolerated by the patient because of their side effects, an operation may be needed.

Surgical Options and Procedures

There are many surgical options. The best option depends on the patient's age, medical condition, and expectations.

With the help of the surgeon, the patient decides which option is best suited for him or her.

The following is an overview of the most common options along with the potential risks and complications.

Some surgical interventions aim at destroying the part of the nerve causing the pain; these are known as 'ablative surgeries'.

'Ablative surgeries' could be done under local or general anesthesia. The nerve sending the pain can be cut as it exits the skull before it reaches the skin. This is done usually through a small incision. Alternatively, absolute alcohol could be injected in the nerve to destroy it. Absolute alcohol is 100 percent, all water having been removed.

This results in complete numbness in the part of the face supplied by the nerve that was either cut or injected. When the nerve is cut the numbness is permanent. Depending on the ability of the nerve to regenerate, the numbness after alcohol injections could be permanent or temporary. For example if the nerve over the eye is cut, the center of the forehead will be numb. If the nerve under the eye is cut, the upper cheek becomes numb.



Some patients cannot tolerate this numb feeling. Before the operation, the surgeon may be able to inject the nerve with a numbing medication such as novocaine. This numbness usually lasts for a short time but could help the patient decide whether or not he/she could tolerate the loss of sensation.

Other ablative procedures aim at injuring part of the ganglion using either electric current, known as 'radiofrequency rhizotomy' or compression of the ganglion by a balloon.

The radiofrequency rhizotomy, also known as 'RF lesion' is usually done under local anesthesia whereas the balloon compression is done under general anesthesia.

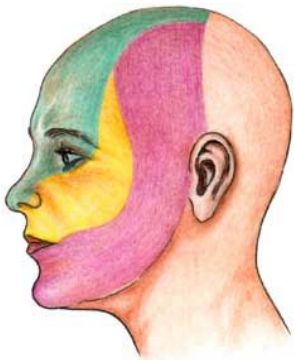
Using X-ray control, also known as fluoroscopy, a surgeon places a long needle through the cheek all the way to the base of the brain and through a small opening in the skull to reach the ganglion.

If the balloon compression operation is used, the surgeon inflates a balloon to compress the ganglion while the patient is asleep.

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If the RF lesion is chosen instead, the nerve is stimulated with a small electric current to see which part of the nerve is close to the needle. This is usually not painful. It helps the surgeon move the needle until he or she is satisfied with its placement. The patient is then put to sleep briefly while the lesion is performed. The patient is then allowed to wake up and is tested for sensation loss to make sure the patient has lost sensation in the targeted area. More than one lesion may need to be done prior to taking the needle out.

Besides ablative procedures, the other option is a decompressive operation that aims at preserving the sensation of the face while taking the pain away. This operation is known as microvascular decompression.



This is a more involved operation that is done under general anesthesia.

The back part of the head is shaved and the skin and skull are opened.

Using the microscope, the surgeon is able to see the nerve as it leaves the brain stem. There usually is a blood vessel compressing the nerve.

The blood vessel is then moved slightly, and a piece of material is placed between it and the nerve to prevent further compression.

In the unlikely case where no blood vessel is found compressing the nerve, the surgeon may go ahead

and cut a part of the nerve to relieve the pain. Numbness will result if the nerve is partially cut.

However, this is not likely to happen and it is important to discuss this option before the surgery.

The skin is then closed and the patient is allowed to wake up.

Risks and Complications

These procedures are safe. There are, however, several possible risks and complications. These are unlikely, but possible. You need to know about them just in case they happen. By being informed, you may be able to help your doctor detect complications early.

The risks and complications vary from procedure to procedure. The more involved the operation the higher the risks and the potential complications.

The risks and complications include those related to anesthesia and those related to any type of surgery.

Balloon compression and Microvascular Decompression procedures are always done under general anesthesia. Risks related to general anesthesia include, but are not limited to, strokes, kidney failure, pneumonia, and blood clots in the legs.

Your anesthesiologist or nurse anesthetist will discuss these risks with you in detail.



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Blood clots in the legs can occur. These usually show up a few days after surgery. It causes the leg to swell and hurt a lot. These blood clots can be dislodged from the legs and go to the lungs where they will cause shortness of breath, chest pain, and possibly even death. Sometimes the shortness of breath can happen without warning.

It is therefore extremely important to let your doctors know if any of these symptoms occur.

Getting out of bed shortly after surgery may help decrease the risk of blood clots.

Some of the risks are seen in any type of surgery. These include:

- Infection, deep or at the skin level. Infections can involve the face or scalp incision. Deep infections may involve the brain or the fluid that circulates around the brain. This is known as meningitis. Treating deep infections may require long-term antibiotics and possibly surgery.
- Bleeding, either during or after the operation. This may require a blood transfusion.
- Skin scars.

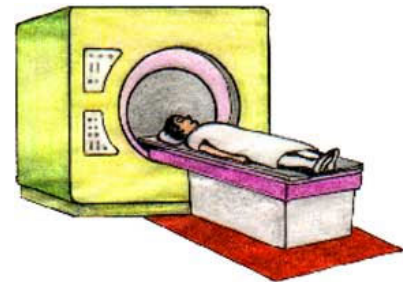
Other risks and complications are related specifically to these procedures. These again are very rare. However, it is important to know about them.

There is always the possibility that the chosen procedure may not help the pain. The procedure may have to be repeated or a different one may have to be done.

Rarely, the loss of sensation can involve the eye itself. In this case, the eye may get injured, leading to damage to the cornea, the clear coating of the eye. This is known as corneal abrasions. This rarely may lead to permanent visual problems and

blindness. The muscles of mastication on the side of the operation may become weaker and cause some pain and difficulty with chewing. This is usually very well tolerated by patients.

In the case of facial numbness, a condition known as 'anesthesia dolorosa' can occur. In this condition, pain may persist in spite of the numbness. This may lead the patient to keep on touching and scratching the involved area in the face, leading to sloughing of the skin and disfigurement.



Because of this and because of the loss of sensation, patients need to inspect their faces daily to make sure no infections or injuries are affecting the numb area of the face.

There are other risks related to the specific procedures. Injecting alcohol around the nerve could lead to sloughing of the skin around the injection area. This is usually of no consequence and improves on its own. Sometimes, however, severe scarring and plastic surgery may be needed.

When the needle is used to either destroy or compress the nerve through the small hole in the skull, the needle itself could cause bleeding inside or around the brain.

This kind of bleeding could be fatal and may necessitate another operation to remove the blood clot.

The needle could, very rarely, also injure other nerves in the vicinity, such as the nerves responsible for vision or movement of the eye. This

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could, in extremely rare cases, result in blindness or double vision.

The microvascular decompression operation done through the back of the head could also result in injury of the hearing nerve, resulting in deafness. This is not likely, but possible.

For that reason, it is important to let your surgeon know if you had any trouble hearing, especially with the opposite ear.

If your only hearing ear is on the side of the trigeminal neuralgia, complete deafness may result from the operation, and you may want to proceed with another surgical option.

Injury to the nerve that controls the face could also occur and lead to paralysis of the face. Patients may not be able to shut the eye completely and may have a drooping of the mouth.

This could be permanent or temporary.

Fluid may also leak from the incision. This may necessitate another operation to fix the leak.

Blood clots in the brain could also occur and could be life threatening requiring another operation.

Death and strokes resulting in permanent paralysis are very unlikely, but possible.

After The Surgery

Depending on which operation is done, you may either go home the same day or few days later.

If you undergo the microvascular decompression, then you will probably spend some time in the intensive care unit to allow the nurses to better monitor your vital signs and neurological status.

They will ask you repeatedly to move your face, arms and legs. They will also ask you questions to assess whether you are oriented. CAT scans of the

head may be done to make sure there are no blood clots in your brain.

After the surgery you will probably still be on your trigeminal neuralgia medication. You will be weaned off them over time, again depending on which operation was done. It may take a few days to a week to know whether the operation was successful.

You should refrain from any heavy lifting or bending until your follow up visit. At that time, your surgeon will decide whether or not you can return to your usual activities.

You should also make sure to call you doctor if you develop any severe headache, fever, visual problems, or fluid leak from the incision. All of these may be signs of serious complications.

Summary

Trigeminal neuralgia is best treated medically. When medications fail, surgical options may be considered.

The choice of the operation depends on the patient's age, medical condition, expectations, as well as the surgeon's advice.

Surgical procedures are usually successful in alleviating the pain and improving the patient's symptoms.

These procedures are safe. Risks and complications are rare. Knowing about them will help you detect and treat them early.

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